

# PE-ALD OF TaN DIFFUSION BARRIER REGION ON LOW-K MATERIALS

## Abstract

Methods of depositing a tantalum-nitride (TaN) diffusion barrier region on low-k materials. The methods include forming a protective layer on the low-k material substrate by performing plasma-enhanced atomic layer deposition (PE-ALD) from tantalum-based precursor and a nitrogen plasma in a chamber. The protective layer has a nitrogen content greater than its tantalum content. A substantially stoichiometric tantalum-nitride layer is then formed by performing PE-ALD from the tantalum-based precursor and a plasma including hydrogen and nitrogen. The invention also includes the tantalum-nitride diffusion barrier region so formed. In one embodiment, the metal precursor includes tantalum penta-chloride ( $\text{TaCl}_5$ ). The invention generates a sharp interface between low-k materials and liner materials.